JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1988, 21, 73–80 NUMBER 1 (SPRING 1988)

MODIFYING FOOD PURCHASES IN SUPERMARKETS WITH MODELING, FEEDBACK, AND GOAL-SETTING PROCEDURES

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We compared several procedures designed to modify consumer food purchases with the objectives of reducing fat and increasing carbohydrate content, and reducing dollar expenditures on food. Participants were 126 volunteer community households which, after a 7-week baseline period, were randomly assigned to video-modeling, video-modeling-feedback, video-lecture, video-lecture-feedback, participant-modeling, video-modeling-discussion, and control conditions. The main dependent measure was a weekly record of food purchases, convertible to percentages of nutrients and dollar expenditures. Results indicated that modeling-feedback and participant-modeling procedures were most effective (e.g., 6% reduction of total fat consumption, 19% dollar savings). Strategies to refine and automate modeling and feedback in supermarkets that may benefit consumers, corporations, and government are discussed.

DESCRIPTORS: health, modeling, feedback, nutrition

Evidence has existed for over two decades linking the high-fat, low-complex carbohydrate diets consumed in western countries to cardiovascular disease (Cummings, 1986). However, only recently a consensus has been reached by scientists ". . . that as much as 25% to 35% of cancer mortality is related to dietary factors" (Greenwald, Sondik, & Lynch, 1986, p. 217). Particular sites (e.g., the colon) for cancer appear to have the highest association with such dietary factors as fat and fiber. It is now believed that diet is as important as smoking for cancer risk (Greenwald et al., 1986).

Despite popular claims suggesting large, healthful dietary changes among consumers (e.g., Brody, 1985), comprehensive and scientific analyses indicate only minimal dietary change in the United States. The average American diet remains about 40% fat, 45% carbohydrates, and 15% protein (Block, Dresser, Hartman, & Carroll, 1985). By contrast, the National Cancer Institute's (NCI) goals for 1990 are 30% fat, 58% carbohydrates, and 12% protein, with a reduction to 25% fat by the year 2000 (Greenwald et al., 1986).

This project was supported by a grant from the National Science Foundation to the first author.

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Although there are some notable exceptions (Lefebvre et al., 1986; Levy, Mathews, Stephenson, Tenney, & Shucker, 1984; Mayer et al., 1986), individual, group, and community interventions have generally shown no, or very minimal, impact on dietary choice. Where there has been evidence of impact (e.g., Mayer et al., 1986), specific procedures, such as point-of-purchase prompts targeted to specific food choices, have been used. It seems likely that other effective behavioral procedures can be adapted for dietary modification with the general population to meet important public health objectives (Hanlon & Picket, 1984). These procedures may also be designed in ways to help consumers save money on food purchases, a prime objective of consumer-oriented policies (Beales, Mazis, Salop, & Staelin, 1981; Engel & Blackwell, 1982; Lee & Zelenick, 1982) and a small number of community and supermarket studies (e.g., Greene, Rouse, Green, & Clay, 1984; Russo, 1977).

Accordingly, in this study, we evaluated procedures designed to modify consumer food purchases. The goal of the project was to reduce the costs of food purchases and to reduce the fat content and increase the complex carbohydrate content of those purchases.

Our prior research on consumer behavior has shown that behavioral (video) modeling and feedback and goal setting are particularly effective strategies (Winett et al., 1982; Winett, Leckliter, Chinn, Stahl, & Love, 1985). The effectiveness of these strategies could be effectively measured using food purchasing behavior because most health professionals agree that dietary behaviors are particularly resistant to change (Brownell, 1986). However, in light of past failures in dietary change, it was important to use a particularly powerful procedure, "participant modeling" (Bandura, 1986), to evaluate a presumably somewhat less powerful procedure involving modeling, feedback, and goal setting (Kazdin, 1984).

Finally, we attempted to evaluate the effectiveness of modeling and communication strategies apart from specific content (Winett, 1986; Wright & Huston, 1983). Therefore, we developed a modeling videotape and a lecture format tape that were almost identical in content.

METHOD

Participants

All participants lived in Blacksburg, Virginia (population, 35,000). The mean age of the participants (defined as the primary shopper in a household) was 39 years (range, 18 to 64). The mean reported gross 1985 income was about $25,000 (range, $10,000 to $75,000), and mean educational level was 3 years of college (range, high school to Ph.D.). On demographic and background information forms completed after recruitment into the project, participants reported a mean of 1.8 health risks or diseases (range, 0 to 10) in their immediate families and 3.0 (range, 0 to 7) for their extended families.

The first contact was made at the potential participant's home. Recruiters gave this person, usually the household's primary shopper, a brief verbal and written explanation of the project. A second personal contact at the home was made within 3 days of the first. A decision on participation was then obtained. Of 585 households contacted, 180 households (31%) agreed to participate.

After recruitment but prior to baseline, 33 households declined to participate. During baseline and intervention periods, 11 households terminated participation. In most cases, the time involved in completing the food checklist was given as the reason for termination. In addition, 10 households were not included in the project because of health concerns and other special circumstances (e.g., food allergies). Thus, after dropouts and exclusions, the total number of participants was 126, and a conservative figure for successful participant recruitment was 22%.

Materials: Video Programs

"Modeling" and "lecture" videotape programs were created for this study. Each program was approximately 30 min long, had virtually the same content, and used the same title, "Optimal Nutrition/Saving Money." Considerable formative and pilot research was done to develop content relevant for the study's participants (Winett, Kramer, Walker, Malone, & Lane, in press) and to overcome viewers' objections or concerns (Manoff, 1985).

The modeling program began with a rationale for nutritious and economical food purchases; argued against some counterparts (e.g., minimal evidence linking diet and health); gave information (e.g., complex carbohydrates are low in calories); and presented an early-middle-aged couple reaching a decision to change dietary practices, finding relevant information and consulting with friends, trying out new procedures (e.g., a complete shopping list) and meals (e.g., a spaghetti and salad, no-meat dinner), and overcoming points of resistance (e.g., husband's beliefs linking eating meat with good health) and obstacles (e.g., bringing nutritious lunches to work).

The program emphasized reducing fat and increasing complex carbohydrates by changing meal proportions (e.g., reducing steak size, increasing potato size), switching from meat to chicken or fish, or having complex carbohydrates as the main part of a dinner (e.g., spaghetti). Strategies for shopping more economically included adhering to a prepared shopping list, buying generic brands, and resisting impulse buying. A nutritional review of the complete list with substitutions (e.g., low-fat yogurt for sour cream) was a key strategy tying together nutritious and economical food purchases.

The modeling program evolved from a storyline with a couple. Scenes occurred in various rooms in the home as well as in a supermarket. Inserts were used to show shopping list construction and the nutritional and caloric content and price of different meals.

Comparability in content between the videotapes was achieved partly by use of a voiceover technique in many parts of the modeling tape. For example, the speaker in the lecture tape (produced in a TV studio) said, "Here are the steps you need to follow in making a complete shopping list." In the modeling tape, the voiceover said, "Here are the steps Mary and Dale need to follow in making a complete shopping list."

Design, Conditions, and Procedures

The project consisted of a 7-week baseline period and a 7-week intervention period. During baseline, all participants recorded their weekly food purchases (excluding restaurants) on checklists developed for this purpose. These recordings continued during intervention.

At the end of baseline, participants were assigned to conditions using a stratified random assignment procedure. The stratification variables were seven distinct neighborhoods and the percentage of total fat for all food purchases during baseline. Within each neighborhood, a median split was performed on participants' total fat content during baseline. Participants were randomly assigned to conditions from each neighborhood by each fat content segment, but with about one third more participants assigned to the control condition than to any of the other conditions.

There were seven different conditions in the project:

Control ($n = 26$). Participants in this condition were told the importance of control conditions for scientific studies. Participants completed all study forms and continued to record their weekly food purchases on the food checklist.

Video-modeling-no feedback ($n = 17$). In this condition, an appointment was arranged for a home viewing of the modeling version of "Optimal Nutrition/Saving Money." All adults in the household were present for the viewing. Interactions between project staff and participants were kept to a minimum during home visits. Following the video, participants received a one- or two-sentence nutrition-purchase prompt (e.g., "Purchase more complex carbohydrates such as . . . .") in a weekly data packet that was delivered to the home. The prompt, different for each of 7 weeks, used key points from the video. As with the control condition, food purchases continued to be recorded on the food checklist.

Video-modeling-feedback ($n = 20$). This condition was the same as the above condition except that for 7 consecutive weeks participants received written feedback on their weekly food purchases. Food purchases for a week (and for all conditions) were reported on a form, retrieved by a project staff person on a Monday, and entered into a computer. Feedback was usually delivered to a participant's home on a Friday. Thus, feedback often followed a food shopping day by 6 days but often preceded the next (weekend) shopping. The feedback was based on the study's major dependent measure, and every week showed a percentage breakdown for the baseline period of complex carbohydrates, simple carbohydrates, total carbohydrates, protein, total fat, saturated fat, and costs for food items only. The same breakdown was shown for the most recent shopping. Standardized written statements indicated how far the participant was from specified NCI goals (i.e., 30% fat), with additional standardized evaluative statements given for positive or negative change relative to the goals for each nutrient and monetary expenditure. Every second week, participants received a second similar form that provided a cumulative analysis and summary of their food purchases to date.

Video-lecture-no feedback ($n = 18$). This condition was identical to video-modeling-no feedback except participants viewed the lecture version of "Optimal Nutrition/Saving Money."

Video-lecture-feedback ($n = 17$). This condition was identical to the previous one except that feedback, as described earlier, was provided.

Video-participant modeling-personal feedback ($n = 14$). This condition began exactly in the same way as modeling-feedback. However, several days after showing the video and during a prearranged appointment, the second author met with the participant at home. The appointment focused on developing with the participant a complete shopping list and performing a nutritional review, a major strategy from the video. The second author next took the participant on a prearranged shopping trip at the participant's usual shopping time and supermarket. A trip took about 1 hr, during which the second author walked about the store with the participant and answered any questions. Weekly feedback included the written form as in the prior conditions and feedback provided by the second author in a 5-min telephone call. The call reviewed all feedback items and goals on the written form, and participants were able to ask and receive answers to any pertinent question.

Video-modeling-discussion-no feedback (n = 14). This condition was the same as video-modeling-no feedback except that during a prearranged home visit the second author held a general 45- to 60-min discussion about nutrition with the participant. No shopping trip occurred.

Measurement System

Measures. The major dependent measure was derived from a weekly measure of reported food purchases. A second set of measures focused on nutrition and food shopping knowledge, health beliefs, health risks, readiness to change, liking and attention to the video, consumer acceptability of the videotapes and recommended strategies, and use of shopping lists. Descriptions and results for the second set are reported in detail elsewhere (Kramer, 1987).

Participants reported all food purchases for a week on a six-page form containing about 250 food items in standard quantities (e.g., ½ gal, 1 lb), grouped by category (e.g., dairy). The participant checked the relevant items and quantities or wrote in items not listed.

All items on the checklist, plus any additional items, were given standard nutritional and caloric values (Pennington & Church, 1985; USDA, 1976) in a computer software program. Prices were assigned to every item. These prices were obtained at the start of baseline from price lists at the largest supermarket chain in the area.

Thus, the computer could generate a summary of a participant's weekly food purchases that included, for example, information that the purchases consisted of 15% simple carbohydrates, 15% complex carbohydrates, 30% total carbohydrates, 20% protein, 20% saturated fat, and 50% total fat. These percentages were then compared to goal figures (e.g., 50% total fat versus the NCI's 30% total fat) when used for feedback. In addition, the weekly cost for food purchases was calculated (e.g., $60), and for feedback was compared to a dollar goal (e.g., $51). These same measures were generated each week for each condition, yielding a mean percentage of nutrients (e.g., 38% total fat), and mean dollars spent for food per week (e.g., $51) for each condition.

Reliability. The procedure for measuring the reliability of reported food purchases was based on food shopping receipts provided each week by participants. However, reliability checks could only be consistently done with approximately 69% of the participants who frequently shopped at a supermarket that gave computer-generated, item-by-item receipts (e.g., listing an item as 2% milk, gallon). In addition, it was still possible for these participants to include (or omit) items on their food checklists that were bought outside of a regular shopping trip (e.g., at a convenience store) for which no receipt was available. Thus, even across this subset of participants, it was not possible to determine completely the reliability of reported food purchases.

Within these limitations, reliability checks were made for 87 participants whose mean cost for food items was equal to or greater than $25 per week. For each participant who regularly shopped at a detailed-receipt supermarket, 1 week was selected at random for baseline and 1 week for intervention for checking. For participants who did not regularly shop at such stores, 1 week was picked during baseline and 1 week during intervention in which a detailed receipt was available. Often, these weeks were the only ones available for checking.

The formula for item reliability was: number of items that corresponded between the checklist and receipt, divided by the number of receipt items. A correction figure was also used for nonrecorded items: items on the checklist but not on the receipt, divided by the number of checklist items. The correction figure was subtracted from the first figure, and the result was multiplied by 100. For example, for corresponding items = 22, receipt items = 25, items on checklist but not on receipt = 2, and checklist items = 24, (22/25 = 0.88) − (2/24 = 0.08) = 0.80 (100%) = 80%.

For 87 item-reliability checks during baseline, the mean reliability was about 74%. For 87 checks during intervention, reliability was 77%. Across participants and both periods, a mean of 22 items corresponded, 28 items were noted on receipts, 24 items were noted on the checklist, and 1 item was on the checklist but not the receipt.

RESULTS

An examination of food purchase data indicated that shoppers who purchased less that $25 per week contributed considerable variability to the data. Many of these (n = 39) participants were single individuals or couples who ate many meals per week away from home. Thus, in these cases, food shopping data represented a small percentage of actual food consumption each week. Analyses of food shopping data including these shoppers showed no differences between conditions during baseline or intervention.

Removal of shoppers buying less than $25 per week left 87 participants. However, only 62 of these participants regularly (three or more shopping receipts in both baseline and intervention) shopped in stores providing detailed receipts. There were 13 of these participants in the control condition, 8 in modeling-no feedback, 10 in modeling-feedback, 8 in lecture-no feedback, 11 in lecture-feedback, 6 in participant modeling-feedback, and 6 in modeling-discussion. Thus, with the exception of lecture-feedback (65%), all other conditions retained about 50% of participants when only those shoppers purchasing more than $25 per week and who usually shopped in supermarkets giving detailed receipts were included in analyses. However, results of analyses with *all* shoppers purchasing more than $25 per week ($n$ = 87), compared to analyses with those same shoppers *with receipts* (n = 62), are similar, with data from the latter subsample presented here.

Table 1 presents the nutritional content and cost from baseline food shopping, and percentage changes on these measures during intervention, across the seven conditions. There was considerable variability within conditions, and the control and modeling-no feedback conditions showed a higher carbohydrate and lower total fat content than did the other five conditions. There were also apparent differences in mean cost per week among conditions.

Examination of Table 1 indicates that most change appeared in conditions in which feedback was used. Except for the largest increase in simple carbohydrates (5.1%; apparently from increasing fruits and vegetables) and largest reduction in saturated fat (2.2%) in the participant modeling-feedback condition, there is no evidence that personal contact was more effective for nutrient change than the combination of video modeling and written feedback. The largest increase in complex carbohydrates (5.4%) and the largest reduction in total fat (6.7%) and in expenditures (26.4%) was evident for the modeling-feedback condition. Lecture-feedback showed smaller changes except for reductions in saturated fat (1.2%) and in expenditures (15.6%).

Multivariate analyses of covariance (MANCOVAs) were used to analyze the data. All assumptions for the MANCOVAs were met (including normality, independence, and heterogeneity of the slopes of the covariates). MANCOVAs were performed on the dependent variables (i.e., the change in the scores for each nutrient and dollar expenditures from the mean preintervention score across 7 weeks for each participant, to the mean postintervention score), using the preintervention scores as covariates. Thus, there were seven dependent variables (i.e., change scores on the nutrients) and seven covariates (i.e., each preintervention score).

To test for treatment effects, significant MANCOVAs were followed by planned comparisons. Due to the number of planned comparisons that were undertaken, the Bonferroni correction (Neter & Wasserman, 1974) was used to adjust for multiple significance tests (setting the alpha at .05).

Table 1
Mean Nutrient Content in Percentages and Dollars Spent Weekly for Food Purchases During Baseline and Percentage Changes in These Measures During Intervention for Each Group.[1]

	Control (n = 13)	Modeling-no feedback (n = 8)	Modeling-feedback (n = 10)	Lecture-no feedback (n = 8)	Lecture-feedback (n = 11)	Participant modeling-feedback (n = 6)	Modeling-discussion (n = 6)	Sample means (n = 62)
Complex carbohydrates								
Mean	38.8	34.6	30.2	32.4	32.3	30.0	33.5	32.8
SD	8.9	4.7	5.8	5.9	5.9	4.0	6.7	6.3
% change	−1.2	−2.9	5.4	1.9	2.9	1.5	−1.0	0.9
Simple carbohydrates								
Mean	9.8	10.3	9.1	9.3	10.7	10.9	10.3	10.0
SD	4.0	3.4	4.3	4.0	4.8	2.5	3.2	3.9
% change	1.2	1.3	0.1	−1.3	0.6	5.1	0.3	1.1
Total carbohydrates								
Mean	45.6	44.9	39.3	41.1	43.0	41.1	43.8	42.8
SD	7.6	4.4	4.9	5.1	5.2	3.3	5.9	5.3
% change	0.0	−1.6	5.5	0.6	3.5	6.6	−0.7	2.0
Protein								
Mean	17.3	16.7	17.6	18.3	17.2	17.6	15.6	17.2
SD	2.5	3.2	4.2	3.9	3.0	2.5	2.2	3.1
% change	−1.6	−1.0	0.8	0.6	−1.1	−1.7	1.2	−0.4
Saturated fat								
Mean	12.6	12.7	13.1	13.3	13.6	14.4	12.1	13.1
SD	3.6	2.9	2.6	2.9	3.2	2.9	3.0	2.9
% change	0.9	0.4	−0.9	−0.4	−1.2	−2.2	0.7	−0.4
Total fat								
Mean	35.4	37.1	41.7	39.0	38.0	39.3	39.0	38.3
SD	7.4	6.5	5.4	2.4	5.5	5.6	6.3	5.9
% change	1.3	1.8	−6.7	−0.4	−2.6	−5.5	0.7	−1.7
Dollars								
Mean	51.9	48.0	57.9	45.6	51.3	47.0	45.6	50.6
SD	15.7	13.8	29.3	14.0	15.6	11.3	3.1	17.0
% change	−8.7	−12.5	−26.4	−2.0	−15.6	−12.0	−2.7	−11.4

[1] Includes dollars spent on food items only.

A significant treatment effect emerged for simple carbohydrates, $F(12, 48) = 2.09, p < .05$. Planned comparisons revealed that participant modeling was significantly different from the other treatments on this variable, $F(1, 59) = 9.49, p < .003$.

In addition, treatment differences for total fat approached significance, $F(12, 48) = 2.13, p < .06$. The planned comparisons revealed significant differences between feedback and no feedback treatments, $F(1, 59) = 8.63, p < .005$.

Because the MANCOVAs demonstrated that some preintervention scores were significant covariates (and others were not), one or two covariates were selected and analyses of covariances (ANCOVAs) were performed on the total fat change scores. The univariate results for the change in total fat (with baseline protein level and dollar expenditures as covariates) demonstrated a significant treatment effect, $F(6, 54) = 3.05, p < .01$. The planned comparison revealed that significant treatment differences could be found between the feedback and no-feedback groups, $F(1, 59) = 8.83, p < .0045$. The other treatment difference that approached significance was the modeling-feedback condition compared to the modeling-no feedback condition, $F(1, 59) = 6.84, p < .01$. However, this last comparison was not found to be significant when adjustments were made for experiment-wise error rate.

The data were also examined for rates of individual participant responsiveness within condition ($n = 62$). One measure was for "approaching (<32%) the NCI guideline" for total fat, using each participant's total fat mean per period. These rates for each condition, for baseline and intervention were control, 30.7%, 23.1%; modeling-no feedback, 12.5%, 12.5%; modeling-feedback, 10%, 60%; lecture-no feedback, 0%, 0%; lecture-feedback, 27.3%, 36.4%; participant modeling, 14.3%, 28.6%; and modeling-discussion, 16.6%, 0%.

DISCUSSION

The present study is best seen as an initial effort to modify food purchases in accordance with healthful guidelines and consumer savings. The study provided some evidence that feedback and goal setting, particularly when combined with the modeling formats, may effectively modify food purchases.

The major evidence from this study for food purchase modification was the reduction in total fat. This finding is important because relatively clear experimental data support the benefits and effects of reducing total fat in the diet (Puska et al., 1985). However, the objectives of increasing total and complex carbohydrates and decreasing dollar expenditures were at best minimally fulfilled.

Moreover, individuals in this study were a self-selected sample, because only 22% of the individuals originally approached participated throughout the study. Although examination of Table 1 indicates that nutritional content of the sample participants' food purchases was similar to national norms, prior interest in nutrition and/or savings on food purchases may distinguish this sample. In addition, it was not possible to monitor participants' purchases in restaurants or how food was prepared at home. Thus, the overall nutritional and health impact of this study's interventions remains unclear.

Subsequent studies should recruit large samples of shoppers directly from supermarkets providing detailed receipts. These receipts alone can be used for individual data, perhaps supplemented by a checklist on which a consumer could list food purchased in other stores. These shoppers should be followed for long periods of time (e.g., 6 months to 1 year), and aggregate store data on selected products can also be used to evaluate the impact of any intervention (Greene et al., 1984). As noted, additional monitoring of eating habits is also required to fully assess overall health impact.

However, the changes found in this study may not be as minimal as they may first appear. For example, in the modeling-feedback condition, participants showed a relative change in fat content from baseline of 16%. In that respect, at least in the short run, shifts in nutrition content were appreciable.

We are now exploring ways in which information systems based on this study's procedures can be used in supermarkets and shopping malls. For example, it is possible to provide in-store feedback on intended and actual purchases. Such feedback could be in the form of a computerized shopping list prepared at the home or store. In addition, feedback could be incorporated into the receipts. This feedback would be in close temporal proximity to target behaviors and could also make salient suggestions for alternate food choices. In-store modeling via more specific, very short messages and strategically placed TV monitors that are consumer-activated may prove to be effective. Such "electronic merchandising" is being tried in a number of supermarkets, but it appears that few if any of these systems follow behavioral principles (Winett, 1986).

It is also possible that a mass media campaign based on modeling principles can be effective, particularly if coordinated with in-store programming. A precedent for government (NCI) and private sector (the Kellogg Company) collaboration was recently set by the elaborate, expensive, and highly successful media campaign promoting high-fiber cereals (Warner, 1987). Promoting good nutrition and economical shopping may also help supermarkets gain additional loyal customers. Profits may increase from an enlarged customer base even though costs for the individual customer may be reduced. Consumers, government, industry, and behavioral researchers could mutually benefit from such efforts to promote more nutritious and economical food purchases.

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Received March 3, 1987
Initial editorial decision April 22, 1987
Revisions received May 11, 1987; June 14, 1987; July 15, 1987
Final acceptance September 11, 1987
Action Editor, Brandon F. Greene